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Meeting Record

IMS:	00-RU-0313
MEETING PURPOSE:	The 18th RU/BNFL Topical Meeting to discuss the TWRS-P Low Activity Waste (LAW) Melter, High Level Waste (HLW) Melter, and Offgas Systems
MEETING DATE/TIME:	March 28, 2000 /1:00 – 5:00 PM
MEETING PLACE:	Walkley Room, BNFL Facility, 3000 George Washington Way, Richland, WA
AGENDA:	1. RU Opening Remarks 2. BNFL discussion of LAW Melter, HLW Melter, and Offgas Systems
ATTENDEES:	See Attachment 1
PREPARED BY:	Ko Chen
CONCURRENCE:	George Kalman

KEY DISCUSSION ITEMS:

The meeting began with a welcome from the RU, the introduction of attendees (Attachment 1) and a review of the meeting agenda. The meeting was divided into two parts. BNFL discussed the TWRS-P LAW melter and HLW melter designs during the first half of the meeting. Because the melter design information presented by BNFL was proprietary, the first half of the meeting was closed to the public.

<u>Overview of The TWRS-P LAW Melter and HLW Melter Design (Attachment 2)</u>

BNFL stated that the objective of the meeting is to identify the safety issues that are related to LAW and HLW melter designs and to describe how the proposed designs address the identified safety issues. BNFL noted that hazards associated with melter operations originate primarily from the following sources:

- Radioactivity from melter feed, melt, product and offgas.

- Generation of NOx from melters.
- Energy from melter power supplies, melter heat and chemical reactions.

Current BNFL control strategies for hazards associated with melter operations are outlined in Attachment 2.

TWRS-P LAW Melter

As part of a prepared presentation, BNFL discussed the LAW melter design, the melter containment configuration, modes of melter operations, melter maintenance procedures, and anticipated off-normal events. BNFL also discussed the sulfate issue and comparison of the TWRS-P melter to the BNFL pilot melter. BNFL concluded this session with a brief discussion of lessons learned from LAW melters operated in other facilities. Transparencies used as part of the above presentation were marked proprietary and are not included with the meeting minutes.

The following are the exchanges between the RU and BNFL on this subject. RU comments and questions are followed by the BNFL response:

- Would molten glass in the melter be able to penetrate through refractory walls of the melter? Molten glass will not penetrate. However, vapor gases may penetrate refractory walls. The containment shell outside refractory walls will act as a barrier for gas penetration.
- The RU noted that all the presentation material on LAW and HLW melter design was marked proprietary although most of the pages did not include anything that appeared to be proprietary. The RU commented that only pages with proprietary information should be marked proprietary.
- What exposure is expected for workers during an air bubbler change-out operation? The projected dose is 1.0 mRem/hour to feet and 0.3 mRem/hour to whole body.
- How does sulfate affect the electrode life? The issue is being evaluated.
- Do jack bolts penetrate the secondary containment? No.

TWRS-P HLW Melter

As part of the prepared presentation, BNFL described the HLW melter design features and characteristics, including the thermal containment of molten glass. BNFL also discussed its planned 3-D modeling of the HLW melter in phase B2. The planned 3-D model of the HLW melter will provide predictions of Joule heating, temperature, electrode current densities, glass flow, particle tracking and settling. Transparencies used as part of the above presentation were marked proprietary and are not included in the meting minutes.

The following are the exchanges between the RU and BNFL on this subject. RU comments and questions are followed by the BNFL response:

- Where does BNFL plan to send spent melters for disposal? Hanford Site.
- What is the cooling jacket made of? "High grade" steel (unspecified).
- How does BNFL plan to account for the effects of noble metal accumulation at the bottom of the melter? BNFL currently has no plan to drain noble metal. If the accumulation reaches a certain level, the melter will be replaced. BNFL sees this to be more a design performance issue, not a safety issue.

The Second Half of The Meeting

The second half of the meeting was open to the public. The RU introduced the public portion of the meeting and briefly went over the transition issues since the February topical meeting. The transition issues included the following:

- The February 2000 topical meeting was held on February 29, 2000 and the meeting minutes were issued on March 14, 2000.
- A preliminary BNFL submittal for the March topical meeting was received by the RU on March 1, 2000.
- A level 1 meeting in preparation for the March 2000 topical meeting was held on March 7, 2000.
- A revised BNFL topical meeting submittal was received by the RU on March 15, 2000.
- The RU comments on the topical meeting submittal were provided to BNFL on March 24, 2000.

Status of ISA Open Issues and Questions

Sixteen of the 133 original ISA open issues and questions remain open. The sixteen open issues and questions include:

Q. 102, Q. 31, Q. 92, A2, A3, A8, A9, A15, A18, C30, D10, D11, D12, D13, D14, D15

Status of Topical Meeting Action Items

As identified in the BNFL letter, dated March 15, 2000, 13 action items remain open. One RU action item is included in the list.

BNFL Presentation

After an introduction by the RU, the BNFL portion of the program occurred. The BNFL agenda included a discussion of the LAW Melter Offgas System (Attachment 3), the HLW Hazards Assessment (Attachment 4), and the LAW Hazards Assessment (Attachment 5).

The LAW Melter Offgas System

BNFL stated that the offgas system is designed to:

- Cool the offgas.
- Control melter pressure and emissions.
- Remove particulates and radionuclides.
- Remove or destroy chemical contaminates.

The LAW melter offgas system has the following design features:

- There will be up to three LAW melters operating during normal operations. Each melter will have its own primary melter offgas system. Each primary offgas system consists of a film cooler, pressure control, submerged bed scrubber (SBS), and a wet electrostatic precipitator (WESP).
- There is one secondary offgas system for all three melters. The secondary system consists of a preheater, high-efficiency particle absorbers (HEPA), heat exchanger, heater, thermal catalytic unit, selective catalytic reduction unit, and a caustic scrubber.
- The HLW melter offgas system is similar to the LAW offgas system except that a high efficiency mist eliminator (HEME) is added for the HLW offgas system.

The schematic drawings for all these units are shown in Attachment 3.

Iodine-129 (I-129) emissions from the BNFL facility were discussed by BNFL in response to ISAR Question 102 (Q. 102). Q. 102 asked for I-129 removal efficiencies and plant release rates. BNFL presented the following information with regard to I-129 inventories:

- A total of 66 Curies (Ci) of I-129 was produced at Hanford.
- A maximum of 27 Ci of I-129 is present in the minimum order quantity (MOQ) tanks.
- A maximum of 12 Ci/year of I-129 could be delivered to the pretreatment facility.

Based on the above information, BNFL calculations were stated to indicate that an unmitigated I-129 release from the TWRS-P facility could result in a maximum off-site dose of 3.3 to 27 mrem/yr. The BNFL calculations were reviewed by the RU prior to the topical meeting. Independent and conservative RU calculations indicate that the maximum annual dose to an individual at the site boundary from an unmitigated release of 12 Ci of I-129 would be 28 mrem. The RU review of the BNFL calculations and the independent RU calculations of iodine-related exposures are documented in an internal RU memorandum, 00-RU-0318, from J. Polehn to L. Miller dated April 11, 2000.

Information presented at the meeting included the BNFL statement that the melter offgas system would provide a DF of at least 100 for iodine. Based on the information presented, the RU concluded that a DF of 100 was a conservative value. Assuming the most unfavorable conditions and using a DF of 100 to mitigate the release of 12 Ci of I-129 in one year, RU calculations indicate that the maximum annual dose to an individual at the site boundary would be 0.28 mrem. The NESHAP annual dose limit from air emissions for the TWRS-P facility is 2 mrem (based on a 20% allocation of the 10 mrem site limit). On February 25, 2000, BNFL submitted a "Best Available Radiological Control Technology " (BARCT) analysis to the State of Washington, indicating a maximum annual dose of 0.27 mrem from I-129 assuming the use of a caustic scrubber. Based on the information presented above, the RU considers I-129 issue and Q. 102 closed.

One important function of the offgas system is pressure control in the melter. The BNFL presentation provided the following information on this subject:

- The current BNFL offgas system can accommodate up to three times of normal non-condensable gas flow and seven times of normal condensable (steam) flow.
- The primary objective of melter pressure control is to achieve steady flow in the offgas system.
- The melter pressure control is achieved by controlling air and in leakage flow to the melter space, sizing the line from the melter to the SBS, varying the speed of the offgas system fans, and controlling the pressure relief setting if necessary.
- BNFL is continuing the development of a dynamic model and performing tests of a prototypic system at Vitreous States Laboratory (VSL). BNFL noted that the fan calculation has been completed for the design flow conditions for both HLW and LAW offgas systems.

Based on lessons learned, BNFL will further:

- Examine credible extremes of operation in a realistic setting.
- Redesign the SBS distribution plate.
- Develop a means to regulate the melter feed pumps to help control the generation of offgas in the melter.
- Develop tested means for keeping the offgas line clean.

The following are exchanges between the RU and BNFL on this subject. RU comments and questions are followed by the BNFL response:

- Are the LAW and HLW offgas systems operated separately and independently? LAW and HLW offgas systems are independent.
- Will BNFL design the offgas system in-house? BNFL will purchase most of the components from vendors. However, BNFL will provide vendors with engineering specifications for the components it purchases.
- Where is the pressure relief device vented to? To the LAW and the HLW offgas system

cells.

- Are there preliminary drawings for the catalytic oxidizer/reducer? No.
- BNFL noted that most of NOx gas is generated from the LAW melter. BNFL expects the LAW melter to generate about 4 or 5 tons of NOx gas per day while a generation of 3000 to 4000 lbs of NOx per year is expected from the HLW melter.
- If there is a pressure event in the offgas system, is it possible for water in the SBS be forced back into the melter? It is possible. However, BNFL has evaluated that scenario and concluded that this is not a credible event.

The HLW Hazards Assessment

BNFL stated the ISM Cycle 2 hazards identification process for HLW was completed in February 2000, and the preliminary HLW DBE selection and identification of performance requirements were completed on March 23, 2000. BNFL expects to complete the control strategy confirmation standards selection by the end of March, 2000. In total, BNFL identified about 80 hazardous events in the areas of operational, industrial safety and radiological safety. DBEs identified by BNFL for the HLW facility include:

- Offgas release due to pressure excursions in the melter.
- Offgas release due to external faults/failures (loss of off-site power, offgas system failures).
- Glass spills.
- Seismic events.

Estimates of both consequences and frequencies for all DBEs were made by BNFL. The estimates are included in Attachment 4. Attachment 4 also includes corresponding control strategies for these DBEs. In general, the consequences of DBEs cited above are severity level 1 (SL 1) for facility and co-located workers, and SL 3 for the public. SL 1 events are defined by BNFL as events with highest consequences (exceeding 25 rem./event for facility and co-located workers and 5 rem/event for the public).

The following are the exchanges between the RU and BNFL on this subject. RU comments and questions are followed by the BNFL response:

- Why are consequences from DBEs for co-located workers higher than for facility workers? Facility workers will be evacuated during accidents and thus their exposure time will be limited.
- Where does the initiating event frequency (0.1 or once every 10 years) for loss of off-site power (LOSP) come from? It is based on the Hanford site database.
- What is the duration of most LOSP events? Most did not last longer than 5 minutes.
- Where will the melter offgas be vented following a LOSP? It will be released to the cell.

The LAW Hazards Assessment

BNFL stated that the ISM Cycle 1 process for the LAW melter was completed in October 1999. However, due to the redesign of the LAW facility, ISM Cycle 2 process for LAW was started late. The hazard identification for the LAW melter was completed in February, 2000. The ISM Cycle 2 control strategy confirmation was completed on March 17, 2000. The identification of preliminary LAW DBEs and performance requirements was completed on March 24, 2000. Hazards identified included foaming in molten glass pool, surge of offgas system, service system faults (cooling water, power, and air), pour system errors, and seismic events. DBEs identified for the LAW melter include:

- Offgas release caused by the loss of power.
- Offgas release caused by seismic events.
- Offgas release caused by the SBS flooding.

Most of DBEs result in insignificant radiological consequences (SL 4). However, toxicological effects of a NO_x release following on exhaust fan failure may pose significant hazards to facility workers (873 ppmv for NO2 and 455 ppmv for NO at the melter gallery). These chemical concentrations are well above the acceptable levels as listed in temporary emergency exposure limits (TEEL-3 or TEEL-2). At a location, 770 meters from the facility (where the offgas plume is assumed to reach the ground), the chemical concentration is estimated by BNFL to be 0.052 ppmv for NO2 and 0.27 ppmv for NO. These concentrations are within the TEEL acceptable levels. Control strategies for this DBE are being developed by BNFL as described in Attachment 4.

The following are the exchanges between the RU and BNFL on this subject. RU comments and questions are followed by the BNFL response:

- Why is BNFL re-evaluating the steam explosion hazard in the melter when previous work done by Fauske & Associates indicates such a hazard is incredible? BNFL will go back to re-check the work of Fauske & Associates to see whether that is the case.
- What is the biggest difference between hazards of HLW and LAW? The HLW melter poses high radiological hazards while the LAW melter poses high toxicological hazards.

LAW Melter Air Bubbler Change-out Simulation

BNFL concluded the topical meeting by showing a simulation of an air bubbler change-out operation in the LAW melter.

Action Items

The RU has provided review comments and questions related to this meeting in Attachment 6.

INFORMATION EXCHANGED:

1. The RU meeting presentation material
2. BNFL handout on the LAW/HLW melter design and safety issues
3. BNFL handout on the LAW melter design (returned to BNFL after the conclusion of the meeting at the request of BNFL)
4. BNFL handout on the HLW melter design (returned to BNFL after the conclusion of the meeting at the request of BNFL)
5. BNFL handout on the LAW melter offgas system
6. BNFL handout on the HLW hazards assessment
7. BNFL handout on the LAW hazards assessment

ATTACHMENTS:

1. The attendance list
2. BNFL handout on the LAW/HLW melter design and safety issues
3. BNFL handout on the LAW melter offgas system
4. BNFL handout on the HLW hazards assessment
5. BNFL handout on the LAW hazards assessment
6. RU Review Questions on BNFL March 2000 Topical Meeting Submittal